

IN THE CLAIMS:

1. A compound of the general formula: $R^1R^2MR^4R^5$ wherein R^1 and R^2 are independently an aryl, alkyl, alkenyl or alkynyl group, wherein at least one of R^1 and R^2 is fully or partially fluorinated, wherein M is selected from group 14 of the periodic table, wherein R^4 and R^5 are independently an alkoxy group, OR^3 , or a halogen group, X, except where M is Si, R^4 and R^5 are both ethoxy groups or both chlorine groups, and R^1 and R^2 are perfluorinated phenyl groups.
2. The compound of claim 1, wherein X is Br or Cl.
3. The compound of claim 1, wherein R^1 and/or R^2 is fully fluorinated.
4. The compound of claim 3, wherein R^1 and/or R^2 is an alkenyl or alkynyl group.
5. The compound of claim 1, wherein R^1 and/or R^2 is an alkyl group having from 1 to 14 carbons, vinyl or allyl group.
6. The compound of claim 1, wherein R^1 and/or R^2 is an alkenyl group.
7. The compound of claim 1, wherein R^1 and/or R^2 is a fully fluorinated alkenyl group.
8. The compound of claim 1, wherein R^1 and/or R^2 is an aryl group having one or more rings, or an alkyl group having from 1 to 14 carbons.
9. The compound of claim 1, wherein R^1 and/or R^2 is an alkynyl group.
10. The compound of claim 1, wherein R^4 and R^5 are independently alkoxy groups.
11. The compound of claim 1, wherein R^4 is an alkoxy group and R^5 is a halogen group.

12. The compound of claim 1, wherein R1 is a fully or partially fluorinated phenyl group substituted with fully or partially fluorinated methyl, vinyl or ethyl groups.
13. The compound of claim 1, wherein OR3 is C1-C4 alkoxy.
14. The compound of claim 1, wherein M is Si, Ge, Al or Sn.
15. The compound of claim 1, wherein X is Cl.
16. The compound of claim 1, wherein X is Br.
17. The compound of claim 1, wherein R4 and R5 are a halogen..
18. The compound of claim 1, wherein R4 and R5 are ethoxy or chlorine groups.
19. The compound of claim 1, wherein R1 and/or R2 is a C2 + straight chain or C3 + branched chain .
20. The compound of claim 1, wherein R1 and/or R2 is a perfluorinated organic group having an unsaturated double bond.
21. The compound of claim 1, wherein R1 and/or R2 is an epoxy group.
22. The compound of claim 1, wherein R2 is an epoxy group.
23. The compound of claim 22, wherein M is Si or Ge.
24. The compound of claim 1, wherein R1 and/or R2 is vinyl.
25. The compound of claim 24, wherein R1 and/or R2 is fully fluorinated vinyl.

26. The compound of claim 1, wherein R4 and R5 are each methoxy or propoxy, M is Si and R1 is perfluorinated phenyl or perfluorinated vinyl.

27. The compound of claim 1, wherein R4 and R5 are bromine, M is Si, and R1 is perfluorinated phenyl.

28. The compound of claim 1, wherein R4 and R5 are ethoxy, M is Si, and R1 is perfluorinated substituted phenyl, or perfluorinated alkyl having from 2 to 8 carbons.

29. The compound of claim 28, wherein R1 and/or R2 is perfluorinated ethyl or propyl.

30. The compound of claim 1, wherein OR3 is methoxy or ethoxy.

31. The compound of claim 1, wherein OR3 is ethoxy.

32. The compound of claim 1, wherein R1 and/or R2 is a fully or partially fluorinated single ring or polycyclic aromatic substituent.

33. The compound of claim 32, wherein R1 and/or R2 has one or two rings.

34. The compound of claim 1, wherein M is Si.

35. The compound of claim 1, wherein R1 is methyl.

36. The compound of claim 1, wherein R1 is ethyl.

37. The compound of claim 1, wherein R1 is propyl.

38. The compound of claim 1, wherein R1 is an alkenyl group and R2 is an aryl group.

39. The compound of claim 1, wherein R1 is an epoxy group and R2 is an aryl group.
40. The compound of claim 1, wherein R1 is an alkynyl group and R2 is an aryl group.
41. The compound of claim 1, wherein R1 has an unsaturated double bond, and R2 has a ring structure.
42. The compound of claim 1, wherein R1 is an alkenyl group and R2 is an alkyl group.
43. The compound of claim 42, wherein R1 is an alkenyl group and R2 is an alkyl group having 4 or more carbons.
44. The compound of claim 1, wherein R1 is an epoxy group and R2 is an alkyl group.
45. The compound of claim 44, wherein R2 is an alkyl group having 4 or more carbons.
46. The compound of claim 1, wherein R1 is an alkynyl group and R2 is an alkyl group.
47. The compound of claim 1, wherein R1 is a vinyl group and R2 is an aryl group.
48. The compound of claim 47, wherein R2 is a phenyl group.
49. The compound of claim 48, wherein the phenyl group is a substituted phenyl group.
50. The compound of claim 1, wherein R1 is a methyl group and R2 is a vinyl or epoxy group.
51. The compound of claim 1, wherein both R1 and R2 are fully fluorinated.
52. The compound of claim 1, wherein one of R1 and R2 is fully fluorinated and the other is partially fluorinated.

53. The compound of claim 52, wherein the partially fluorinated group is an alkyl group having four or more carbon atoms, and wherein the fully fluorinated group is an alkenyl or aryl group.

54. The compound of claim 14, wherein M is Si or Ge.

55. The compound of claim 14, wherein M is Si.

56. The compound of claim 14, wherein M is Ge.

57. A method for making the compound $R^1R^2MR^4R^5$ of claim 1, comprising:

providing a compound MOR_3X_{4-q} where M is an element selected from group 14 of the periodic table, OR3 is an alkoxy group, X is a halogen and q is 3 or 4;

reacting the compound MOR_3X_{4-q} with either a) Mg and R_1X_2 where X_2 is Cl, Br or I and R_1 is an alkyl, alkenyl, aryl, epoxy or alkynyl group, and q = 4, or b) with R_1M_1 where R_1 is an alkyl, alkenyl, aryl, epoxy or alkynyl group and M_1 is an element from group 1 of the periodic table, and q = 3 or 4;

so as to form R_1MOR_3 ;

reacting R_1MOR_3 with a) Mg and R_2X_2 where X_2 is Cl, Br or I and R_1 is an alkyl, alkenyl, aryl, epoxy or alkynyl group, or b) with R_2M_1 where R_2 is an alkyl, alkenyl, aryl, epoxy or alkynyl group and wherein R_2 is fully or partially fluorinated and M_1 is an element from group 1 of the periodic table, or c) with a halogen or halogen compound followed by reacting with R_2M_1 where R_2 is an alkyl, alkenyl, aryl, epoxy or alkynyl group, wherein M_1 is an element from group 1 of the periodic table;

so as to form $R^1R^2MR^4R^5$ wherein R_1 and/or R_2 is fully or partially fluorinated;

and wherein if R_4 and R_5 are a halogen, further reacting $R^1R^2MR^4R^5$ with a halogen or halogen compound.

58. A method for using the compound of claim 1, comprising:

providing the compound of claim 1;

hydrolyzing the compound of claim 1 in the presence of H₂O or D₂O alone or with another compound;

so as to form a compound with an -M-O-M-O- backbone with at least R₁ and R₂ groups bound thereto and having a molecular weight of from 500 to 10,000.

59. The method of claim 58, wherein the compound has a molecular weight of from 1500 to 5000.